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Unlicensed Radio Frequency Devices

By Thomas Kidd - January-March 2006

Unlicensed devices are a category of equipment that does not require a license from the Federal Communications Commission or a frequency assignment from the National Telecommunications and Information Administration. They offer great opportunities to system designers and program managers because of their low cost and minimal administrative overhead. But there are important limitations that could affect your decision to use them.

Authorization to Operate

Any device that uses the electromagnetic spectrum to perform its primary function can be described as spectrum dependent. These devices include transmitters, receivers, and, in some applications, a transmitter and receiver combined in the same unit called a transceiver.

Within the United States and its possessions, the two government agencies that authorize the use of the electromagnetic spectrum are the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA).

The FCC is empowered by Congress to provide authorization to the civil population, state and local governments and commercial users. The NTIA, an office within the Department of Commerce, is empowered by the president of the United States to authorize federal government spectrum users such as the FBI, Department of Homeland Security and U.S. military.

Every transmitter must have some form of authorization to operate. Radio and television stations, satellite uplinks, police and fire department radios, airport radars and microwave communications systems all require licensing from the FCC or authorization from the NTIA. However, unlicensed or non-licensed devices do not require an FCC license or NTIA frequency assignment to operate. Unlicensed devices are authorized by special sections of the rules.

Part 15 Rules

The rules and technical specifications that apply to non-federal use of unlicensed devices are in Title 47 of the Code of Federal Regulations Part 15 (47 CFR 15). There are many parts to Title 47, each regulating a different type of radio operation. For example, Part 11 regulates the Emergency Alert System, Part 59 discusses infrastructure sharing, and Part 97 covers the Amateur Radio Service. Part 15 regulates radio frequency devices and contains language specifically regulating the operation of unlicensed devices.

While there are other parts of Title 47 that authorize the operation of devices without a license, Part 15 is the most common, and the term "Part 15" has become synonymous with consumer unlicensed wireless devices.

Once the FCC has certified a device as Part 15-compliant, it may not be modified. Changing anything that affects the electromagnetic transmission of the device will void the unlicensed status. A change as simple as a different antenna will affect the electromagnetic characteristics and void Part 15 status.

While the FCC regulates non-federal uses of the spectrum, federal transmitters are regulated by the NTIA under the "Manual of Regulations and Procedures for Federal Radio Frequency Management," also known as the "NTIA Manual." Within the NTIA Manual, unlicensed devices are described in Annex K. Annex K mirrors the technical specification of 47 CFR 15 to a great extent, and rules concerning modification of unlicensed equipment apply equally to federal and non-federal users.

Those holding a license or frequency assignment to operate are protected from interference. If licensed devices receive interference from an unlicensed device, and it is reported to the FCC or NTIA, the federal government has the authority to order the user of the offending transmitter to stop transmitting.

Users of unlicensed devices do not have these protections and must accept any interference received, or they must modify operations to eliminate the interference. Protection from interference

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is the single most important advantage of operating in a licensed portion of the spectrum. You must consider whether or not you can accept the risks of operating without these protections before choosing to use unlicensed devices.

Over the past few decades the growth in consumer electronics has led to an increased number of inexpensive devices built to operate without a license. Unlicensed devices are by far the most common form of transmitter available to the consumer. From wireless computer networks to garage door openers, electronic car alarms, to walkie-talkies, nearly all of today's electronic consumer devices are unlicensed.

Walk through the electronics department of any store, and you will see dozens of unlicensed wireless devices. The low cost and wide variety of these devices make them attractive for military commercial off-the-shelf solutions. But the benefits of unlicensed devices must always be balanced with the lack of interference protection.

Paragraph 7.8 of the NTIA Manual, "Purchase And Use of Non-Licensed Devices" says: "Federal Government agencies may purchase 'off-the-shelf' non-licensed devices that conform to the applicable edition of Part 15 of the Federal Communication Commission's (FCC) Rules and Regulations (47 CFR 15) without further authority from the Assistant Secretary." Just like our civilian counterparts, federal operators are not required to get a frequency assignment or license before operating a Part 15 device.

The next sentence of paragraph 7.8 says: "Non-licensed devices subject to FCC certification, notification or verification shall bear the appropriate FCC statement of limitations to operations." This means that somewhere on the device there should be a label stating that the device complies with Part 15 of 47 CFR. If the label doesn't say Part 15, but notes some other part of the FCC rules, get clarification from your spectrum manager.

There are other parts of Title 47 that authorize unlicensed use of a device, but they may not be applicable to federal users or they may have specific limitations that conflict with your mission. If it doesn't say Part 15, it probably isn't covered under Annex K, and you might not be authorized to use it.

The next few sentences of paragraph 7.8 contain the deciding factors for whether a Part 15 device is an appropriate solution for your particular requirement. The first part says: "The agency operating a non-licensed device that causes interference to an authorized radio service shall promptly take steps to eliminate the interference. Upon notification by cognizant spectrum management personnel that the device is causing interference, the operator of the non-licensed device shall cease all radiations from the device until the interference is eliminated."

This means that if your operation causes interference to another spectrum dependent device that is properly licensed or authorized, then you must shut down until the situation can be corrected. If there is no way for you to correct the situation you cannot continue to operate. Authorized users are under no obligation to modify their operations.

The last part of the paragraph continues on the same subject: "Agencies operating a purchased non-licensed device have no vested or recognized right to continued use of the device in any part of the radio frequency spectrum. Non-licensed device operations must accept any interference from any federal or non-federal authorized radio system, other non-licensed device, or industrial, scientific and medical equipment."

If you receive interference from users operating in accordance with their license or frequency assignment, and you cannot fix the problem yourself by either moving your equipment, adjusting your antenna, or some other means, you cannot ask the FCC or NTIA for protection. You must accept the interference even if it renders your equipment unusable.

When considering the use of unlicensed devices it is important to weigh the cost and availability with the lack of protection from interference. There are great benefits to Part 15 and other non-licensed devices because they are generally inexpensive and available from a wide variety of sources.

Part 15 devices continue to be a significant enabling technology behind the wireless revolution. Generally, these devices perform as well and, in some cases, even better than their licensed equivalents. However, you must consider all factors before choosing a non-licensed solution.

Know the Rules

If you have a question about using an unlicensed device or to learn more about unlicensed devices please contact your local spectrum manager.

The NTIA Annex K can be downloaded from <http://www.ntia.doc.gov/osmhome/redbook/K.pdf>.

The entire NTIA Manual is available online at <http://www.ntia.doc.gov/osmhome/redbook/redbook.html/>.

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